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Glenn, III et al.

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[54] VACUUM POWER HEAD WITH BARE FLOOR FEATURE

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[73] Assignee: Ryobi Motor Products Corp., Easley, S.C.

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[51] Int. Cl.[5] A47L 5/34

[52] U.S. Cl. 15/356; 15/365

[58] Field of Search 15/355, 356, 364, 365, 15/366, 367, 373, 354

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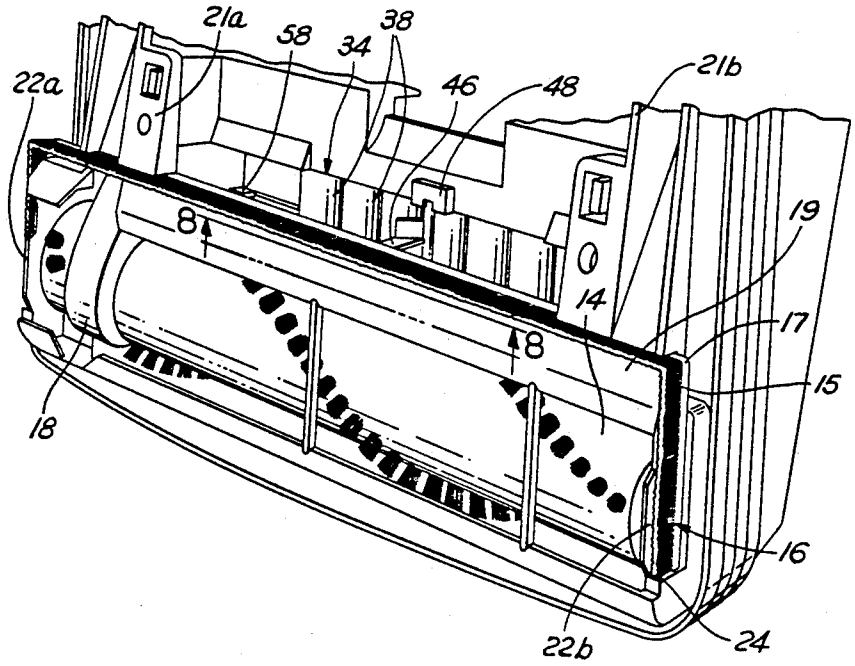
[57] ABSTRACT

A vacuum power head is provided which has a bare floor feature. A vacuum cleaner head assembly defines a vacuum chamber which contains a power driven rotary brush. Located outside of the vacuum chamber adjacent the rotary brush is a generally U-shaped trailing brush. The trailing brush cooperates with a height adjustment mechanism which is movable between a deep carpet position and a bare floor position. As the height adjustment mechanism of the head assembly is moved toward the bare floor position, the trailing brush is automatically moved to an extended position into engagement with the floor. When the height adjustment mechanism is moved from the bare floor position, a spring biases the trailing brush toward a retracted position within the head assembly. An actuator cooperates with the height adjustment mechanism to automatically move the trailing brush between the retracted position and the extended position in response to movement of the height adjustment mechanism.

7 Claims, 4 Drawing Sheets



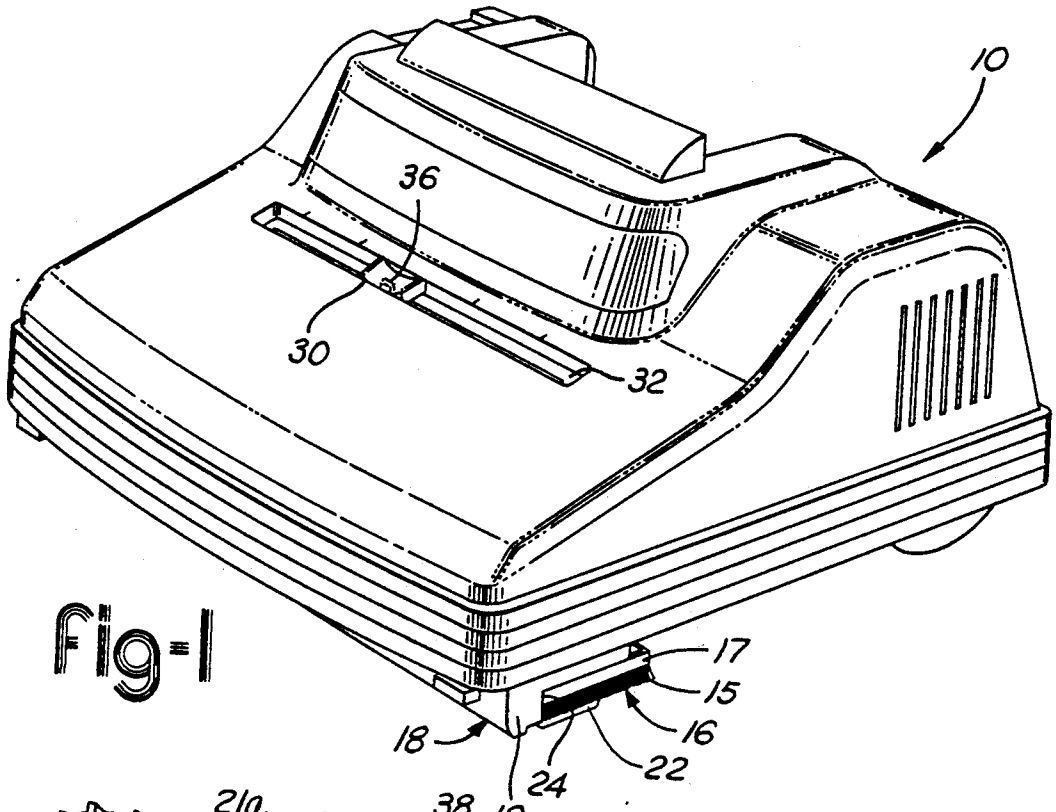

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fig-1

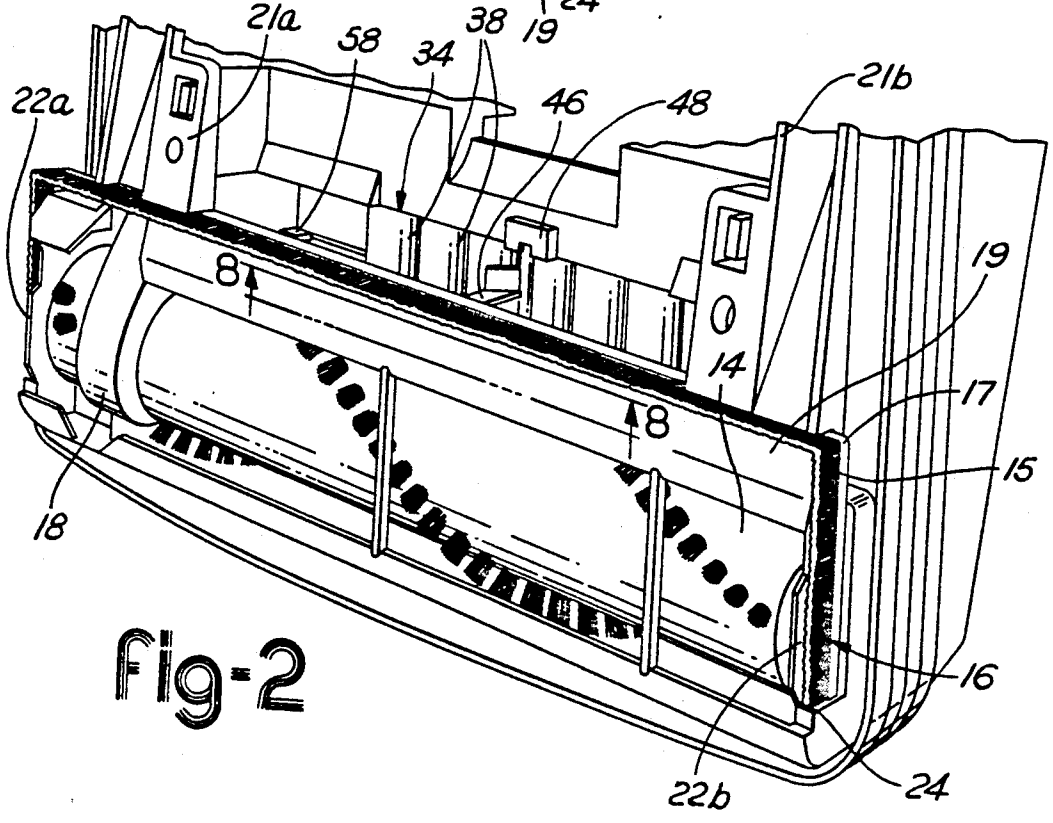
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fig-2

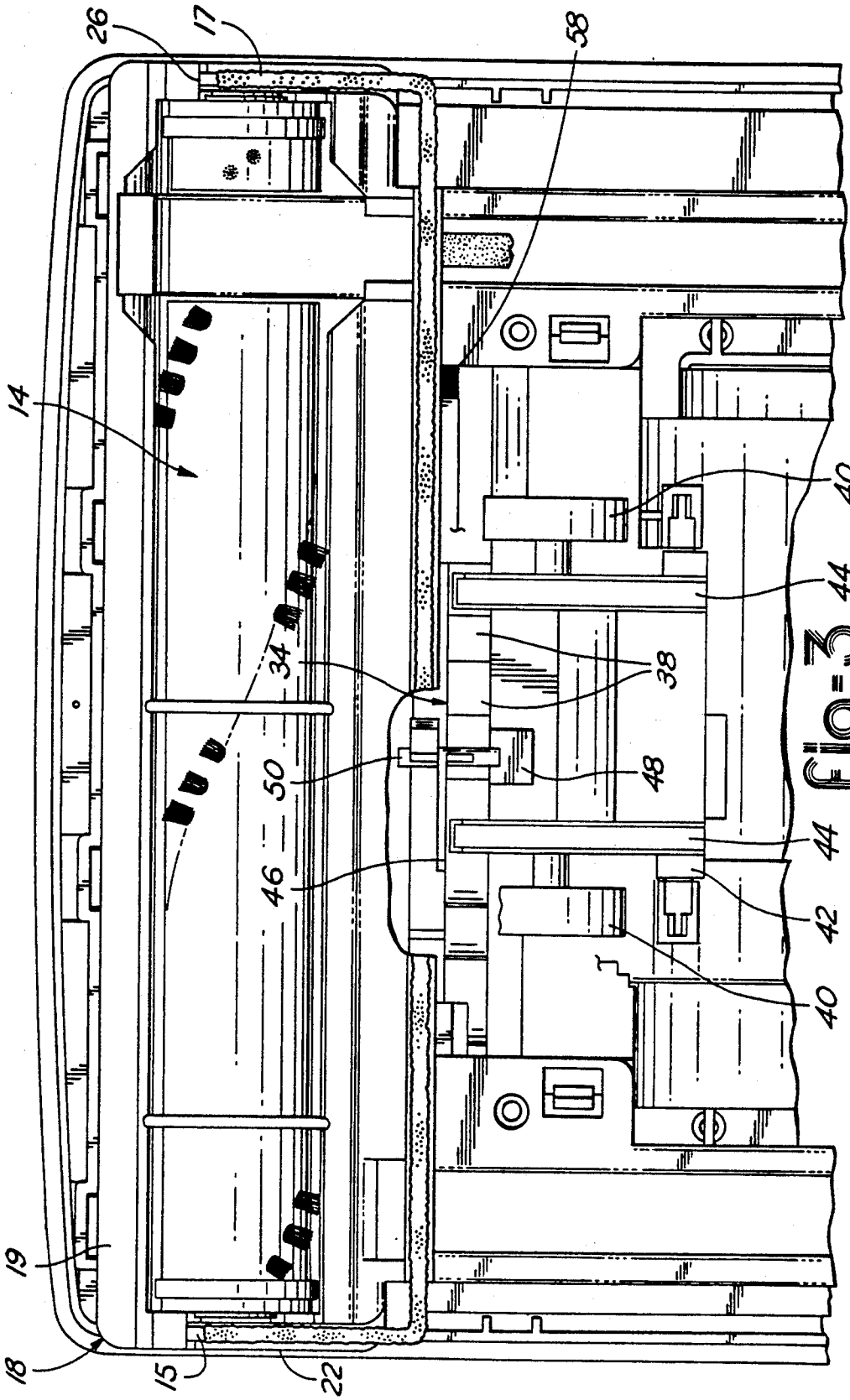

Fig-3

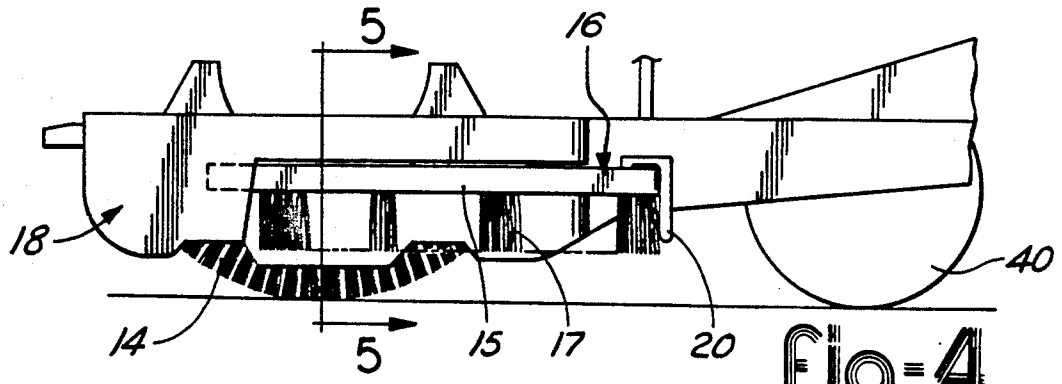

Fig-4

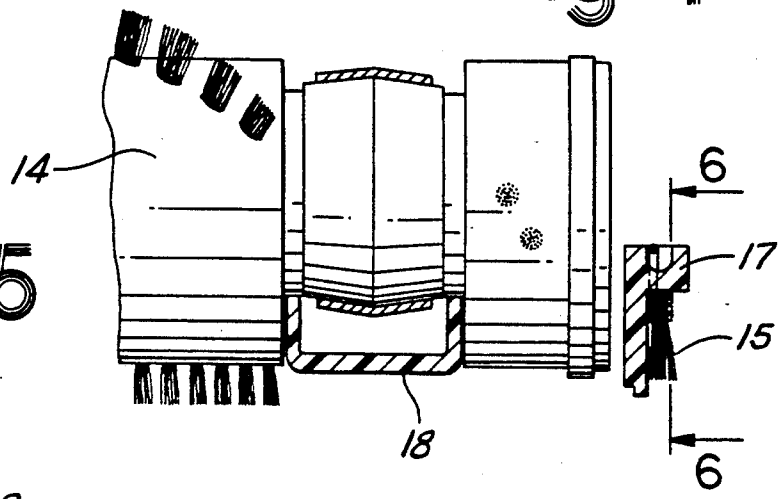

Fig-5

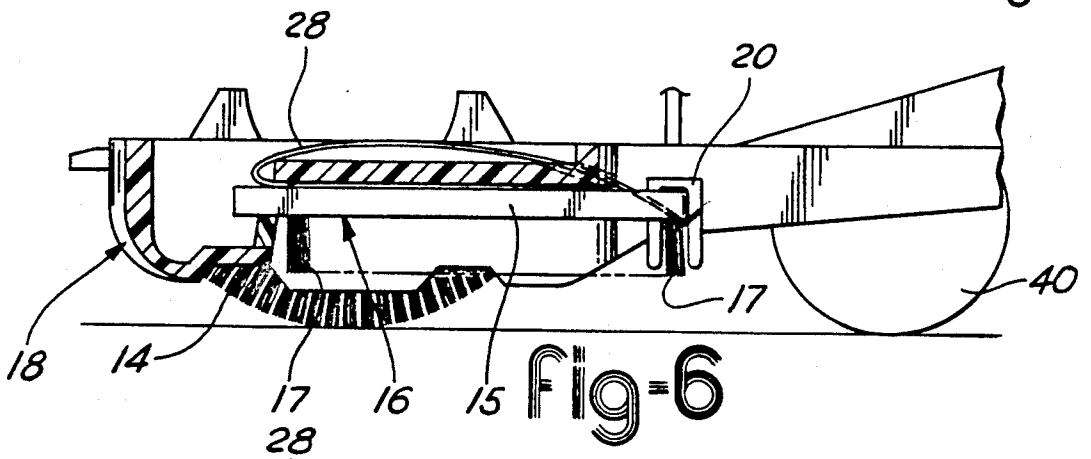

Fig-6

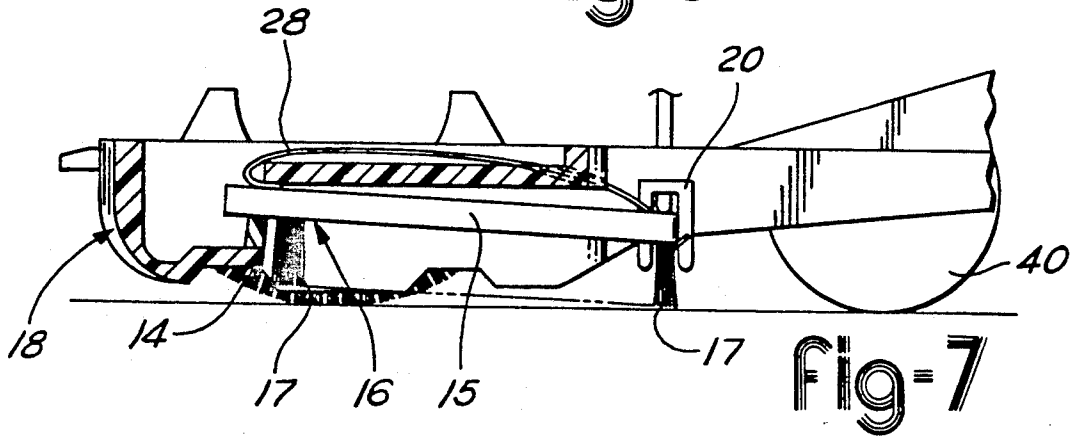

Fig-7

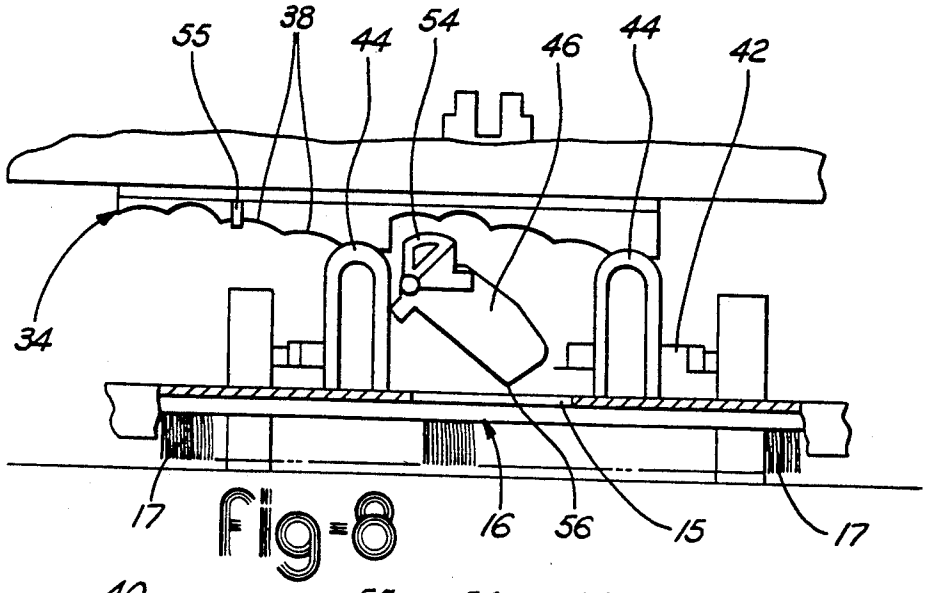

Fig-8

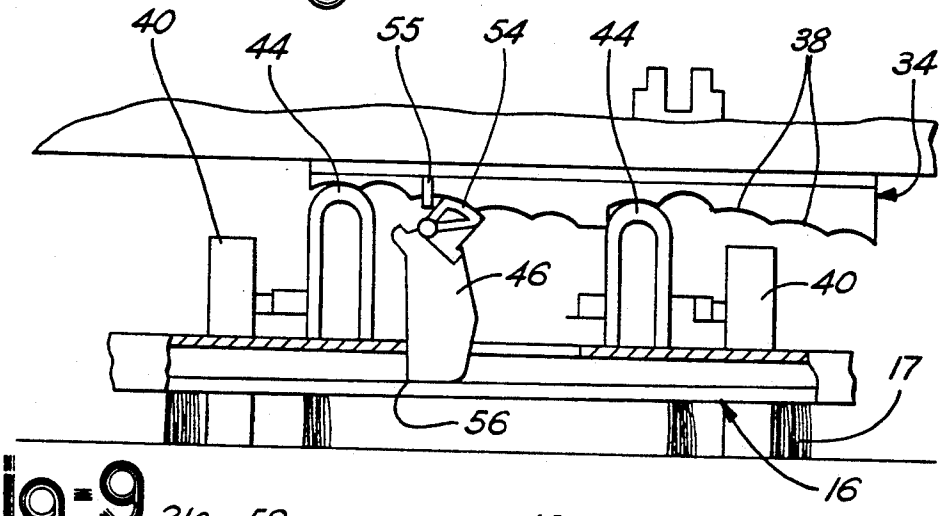

Fig-9

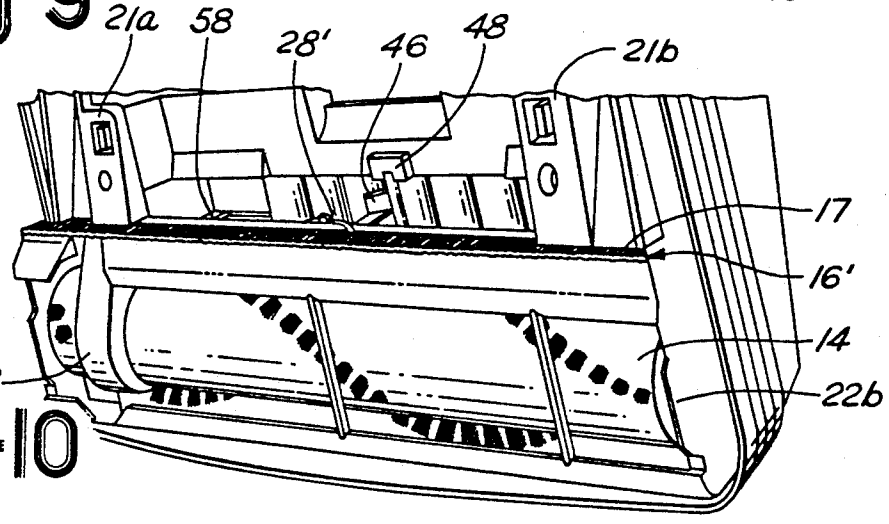

Fig-10

VACUUM POWER HEAD WITH BARE FLOOR FEATURE

TECHNICAL FIELD

This invention relates to vacuum cleaners and more particularly to upright vacuum cleaners having a retractable trailing brush for use on bare floors in the rear of the rotatable brush and the suction nozzle.

BACKGROUND ART

Traditionally, vacuum cleaners having power heads with a rotatable brush have been required to clean surfaces having both deep carpet and bare floors. Therefore it is necessary that this rotatable brush be capable of movement with the nozzle between various selected nozzle heights above the surface to be cleaned. For deep carpet surfaces, the nozzle is positioned at a high elevation relative to the surface to be cleaned and for bare floors, the nozzle is positioned at a low elevation relative the surface to be cleaned.

When cleaning bare floors the friction between the rotatable brush and the floor as a result the cleaning ability of the vacuum cleaner is diminished. The spacing of the base of the vacuum cleaner relative to the bare floor allows large particles of debris to be thrown backward by the rotatable brush at a speed which is too quick for the suction created by the nozzle to carry these particles into the nozzle.

Various attempts have been made to alleviate this problem. Initially, a flexible but fixed contact strip was utilized behind the rotatable brush to prevent the debris from travelling backward behind the nozzle. Examples of such an approach may be seen in U.S. Pat. Nos. 1,288,028 and 1,288,029.

Thereafter, a trailing brush was introduced which was movable between a retracted position within the head assembly and an extended position adjacent the bare floor. This approach utilizes various methods of extending and retracting the trailing brush. In all these approaches, the trailing brush is movable between the extended and retracted positions independent of the height of the head assembly. U.S. Pat. Nos. 4,014,068 to Payne et al., 4,073,031 to Schwartz, and 4,109,342 to Vermillion disclose approaches which rely on a foot or hand pedal to move the trailing brush between the retracted and extended positions.

The present invention is directed to improving known retractable trailing brush technology for use on bare floors by a vacuum cleaner. The present invention is directed to combining the operation of the height adjustment mechanism of a vacuum cleaner and the retractable trailing brush.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a trailing brush which is movable between a retracted position adjacent the head assembly and an extended position adjacent the bare floor surface.

Another object of the present invention is to provide a trailing brush which cooperates with the height adjustment mechanism of an upright vacuum cleaner which automatically moves the trailing brush to an extended position when the height adjustment mechanism is moved to the bare floor position.

A feature of the present invention is to provide an actuator means for actuating the trailing brush when the height adjustment mechanism is set to the bare floor position.

An advantage of the present invention is to provide a trailing brush which stops debris which is thrown backward by the rotatable brush when the height of the head assembly is set to bare floor so that it may be forced into the nozzle by the suction created within the vacuum chamber.

A specific object of the present invention is to provide a vacuum cleaner having a head assembly which defines a vacuum chamber and includes a motor driven rotary brush located therein. A trailing brush is provided which is located within the head assembly. The trailing brush is movable between a retracted position within the head assembly and extended position adjacent a floor surface to be cleaned. A height adjustment mechanism is provided for varying the height of the rotary brush relative to the floor between a plurality of positions ranging from a deep carpet position to a bare floor position. An actuator means is also provided which cooperates with the height adjustment mechanism for actuating the trailing brush in conjunction with the height adjustment mechanism such that the trailing brush is automatically moved to the extended position in response to the height adjustment mechanism being moved to the bare floor position. The trailing brush is moved into the retracted position in response to movement of the height adjustment mechanism being moved away from the bare floor position.

Another specific object of the present invention is to provide a vacuum cleaner having a head assembly which defines a vacuum chamber which includes a motor driven rotary brush located therein. A trailing brush is provided which is located within the head assembly and which is movable between a retracted position within the head assembly and an extended position adjacent the floor surface to be cleaned. A height adjustment mechanism is provided which has a height adjustment member located within the head assembly. The height adjustment member has a plurality of settings corresponding to various heights ranging from a deep carpet position to a bare floor position. The height adjustment member is movable in a first direction in response to movement of the height adjustment mechanism between the deep carpet position and the bare floor position. An arm is provided which is located within the head assembly and cooperates with the height adjustment member. The arm is movable in a second direction generally perpendicular to the first direction in response to movement of the height adjustment member. An axle retainer is provided for retaining a plurality of wheels. The plurality of wheels are movable relative the head assembly in response to movement of the arm between the deep carpet position and the bare floor position. An actuator means is provided which cooperates with the height adjustment mechanism for actuating the trailing brush in conjunction with the height adjustment mechanism. The trailing brush is automatically moved to the extended position in response to the height adjustment mechanism being moved to the bare floor position and the trailing brush is moved to the retracted position in response to movement of the height adjustment mechanism being moved away from the bare floor position.

The above objects and other objects, features, and advantages of the present invention are readily apparent from the following detailed description of the best mode

for carrying out the invention when taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of the head assembly showing the external elements of the present invention;

FIG. **2** is a bottom view in perspective of a portion of the head assembly showing internal elements in accordance with the present invention;

FIG. **3** is an enlarged bottom view of a portion of the head assembly showing the major elements in accordance with the present invention;

FIG. **4** is side view of a portion of the head assembly showing the trailing brush in relation to the rotatable brush and the front wheel;

FIG. **5** is a cross-sectional view taken along the line **5—5** of FIG. **4**;

FIG. **6** is a cross-sectional side view taken along the line **6—6** of FIG. **5**;

FIG. **7** is a side view of a portion of the head assembly similar to that shown in FIG. **6**, showing the trailing brush in the extended position;

FIG. **8** is a cross-sectional end view of the internal portion of the head assembly showing a lever initiating contact with the trailing brush in accordance with the present invention;

FIG. **9** is a view similar to that shown in FIG. **8** showing the upper surface of the lever overcoming the bias of the springs moving the trailing brush to the extended position; and

FIG. **10** is an alternate embodiment of the head assembly having a straight trailing brush.

DETAILED DESCRIPTION OF THE INVENTION

The preferred embodiment of the present invention is illustrated in FIGS. **1** through **9**. As shown in FIGS. **1** and **2**, a vacuum cleaner head assembly **10**, defines a vacuum chamber **12** in the front portion of the head assembly **10**. A rotary brush **14** is located within the vacuum chamber **12**. An electric motor (not shown), drives the rotary brush **14** which agitates the surface to be cleaned.

A trailing brush **16** is pivotally mounted behind the rotary brush **14** outside of the vacuum chamber **12**. The trailing brush **16** is generally U-shaped (as shown in FIGS. **2**, **3** and **5**), such that the trailing brush **16** surrounds or borders the vacuum chamber **12**. The trailing brush **16** is located behind and along both sides of the rotary brush **14** just outside of the vacuum chamber **12**. The trailing brush **16** is formed of a generally U-shaped holding strip **15** which holds bristles **17** which form the trailing brush **16**. The purpose of the trailing brush **16** is to engage the surface to be cleaned when the vacuum is set to the bare floor position. The positioning of the trailing brush **16** along the surface to be cleaned is to prevent large pieces of debris which, as shown in FIG. **7**, are not initially drawn into the vacuum chamber **12** from traveling longitudinally along the floor beneath the vacuum cleaner. Instead, debris is caught in the trailing brush **16** until forced back into the vacuum chamber **12** by the suction created therein. The trailing brush **16** thereby improves the efficiency and cleaning power of the vacuum cleaner.

As shown in FIGS. **2** and **3**, a retaining member **18** removably cooperates with the head assembly **10** to retain the rotary brush **14** and house the trailing brush **16**. The retaining member **18** snap fits into the head assembly **10** ensuring that the rotary brush **14** is retained. The retaining member **18** has a generally rectangular body **19** which extends across the width of the head assembly **10**. Two legs **21***a* and **21***b* extend rearwardly from the retaining member **18** toward the rear of the head assembly **10**. Located between the body **19** and the legs **21***a* and **21***b* is a channel **20**. Cutouts **22***a* and **22***b* are located along the sides of the body **19** which sufficiently reduces the width of the body **19** to accommodate the trailing brush **16**. The cutouts **22***a* and **22***b* extend to a location toward the front of the body **19**. The body **19** then attains its original width, forming a shoulder **24**.

The U-shaped trailing brush **16** shown in FIGS. **2** and **3**, has two free ends, each of which is inserted into an aperture **26** located in each shoulder **24**. A pair of springs **28***a* and **28***b* are affixed at one end to the free ends of the trailing brush **16** to secure it into position. The other end of each spring **28***a*, **28***b* is secured to the body **19** at cutouts **22***a* and **22***b*. The attachment of each spring **28***a* and **28***b* in this fashion biases the trailing brush **16** toward a retracted position, shown in FIGS. **2**,**4** and **6**, wherein the trailing brush **16** is seated within the channel **20**.

An alternative embodiment of a trailing brush is shown in FIG. **10**. In this embodiment, the trailing brush **16'** is straight, rather than having a U-shaped configuration surrounding the vacuum chamber **12**. The trailing brush **16'** functions in a similar manner as in the embodiment shown in FIGS. **2**, **3** and **5**. Spring **28'** is located centrally on the retaining member **18** and biases the trailing brush **16'** to the retracted position. By locating the spring **28'** adjacent to the centrally located lever **46** flexing of the trailing brush **16'** can be minimized.

A height adjustment mechanism is formed by a combination of elements described in the following two paragraphs. A height adjustment knob **30** is located on the upper external surface of the head assembly **10** as shown in FIG. **1**. The height adjustment knob **30** fits within a groove **32** located within the upper external surface of the head assembly **10**. The knob **30** cooperates with a slide **34**, located within the head assembly **10**. The knob **30** is seated upon a protrusion **36** integrally formed with the slide **34**. As shown in FIGS. **2**, **3**, **8** and **9**, the underside of the slide **34** has a series of stair step detents **38**. The detents **38** vary in height corresponding to varying height positions of a front pair wheels **40**. An axle retainer assembly **42** is mounted to the head assembly **10**. The assembly **42** has a pair of arms **44** which cooperate with detents **38** allowing the wheels **40** to pivot. The wheels **40**, the arms **44**, the detents **38** and the knob **30** cooperate to vary the height of the head assembly **10** between a bare floor position (shown in FIG. **7**) and a deep carpet position (shown in FIG. **4**).

As shown in FIGS. **2**, **3**, **8** and **9**, a lever **46** is pivotally connected to the head assembly **10** by a retainer member **48** and a notch **50** located on opposite sides of the lever **46**. The retainer member **48** is affixed to the head assembly **10** by means such as gluing. A retaining spring **52** has one end affixed to the head assembly **10** and the other end is affixed to the lever **46**, adjacent the notch **50**, to prevent the lever **46***b* from becoming disengaged with the notch **50**.

As shown in FIGS. **8** and **9**, the lever **46** pivots about an axis which is generally perpendicular to the longitudinal direction of travel of the slide **34**. The lever **46** has a generally U-shaped bottom surface **54** which is en-

gaged by a projection **55** on the slide **34** as the slide **34** moves toward the bare floor position. The projection **55** engages the bottom surface **54** causing the lever **46** to pivot about its axis. As the lever **46** pivots about its axis, a cammed upper surface **56** engages the holding strip **15** of the trailing brush **16**. As the slide **34** continues to travel toward the bare floor position, the projection **55** continues to engage the bottom surface **54**. This continued engagement by the projection **55** causes the lever **46** to continue to pivot, resulting in the upper surface **56** overcoming the bias of the springs **28***a* and **28***b* (spring **28***a* shown in FIG. **7**). Once the lever **46** has overcome the bias of the springs **28***a* and **28***b*, the lever urges the trailing brush **16** to the extended position in contact with the bare floor. The slide **34** continues to travel toward the bare floor position while the arms **44** travel within the detent **38** which corresponds to the bare floor position until the slide **34** contacts a stop **58** (shown in FIGS. **2** and **3**) affixed to the head assembly **10**. This combination of the lever **46**, the slide **34** and the projection **55** provide a means for actuating the trailing brush **16**. It is understood that alternative elements may be utilized while still obtaining the same results of actuating the trailing brush **16**.

As shown in FIGS. **8** and **9**, as the slide **34** moves in a first direction, generally longitudinally, between the deep carpet position and the bare floor position, the arms **44** move in a second direction generally perpendicular to the first direction. The arms **44** travel over the detents **38** as the slide **34** moves along between positions. The height of the detents **38** get progressively higher along the direction of movement of the slide **34** toward the bare floor position until the second last detent **38**. This is the position where the trailing brush **16** and the rotary brush **14** are simultaneously at their lowest position for cleaning very short fiber carpets. The last detent **38** (the bare floor position) is slightly lower than this highest position. In the bare floor position, it is desirable for only the trailing brush **16** to be in contact with the surface and to have the rotary brush **14** raised slightly above the surface to avoid having the rotary brush **14** beating against the bare floor potentially damaging the rotary brush **14** and/or the bare floor.

As the knob **30** is moved away from the bare floor position toward the deep carpet position, the springs **28***a* and **28***b* bias the trailing brush **16** back to the retracted position. This is accomplished by having the upper surface **56** cam away from and release contact with the trailing brush **16**.

While the best mode for carrying out the invention has been described in detail, those familiar with the art to which this invention relates will recognize various alternative designs and embodiments for practicing the invention as defined by the following claims.

What is claimed is:

1. A vacuum cleaner comprising a head assembly having an elongate vacuum chamber extending the width thereof and including a motor driven cylindrical rotary brush located therein and extending substantially the full width of said vacuum chamber, said vacuum cleaner further comprising:

a trailing brush located within said head assembly adjacent said vacuum chamber, at least a transversely extending main portion of said brush being positioned to the rear of said vacuum chamber and extending in generally parallel alignment with said rotary brush for the full length thereof, said trailing brush being movable between a retracted position within the head assembly and an extended position adjacent a floor surface to be cleaned;

a height adjustment mechanism for varying the height of said rotary brush relative to the floor between a plurality of height positions ranging from a deep carpet position to a bare floor position;

said height adjustment mechanism including (i) an axle retainer assembly having a plurality of floor engaging wheels, said axle retainer assembly being pivotally carried on said head assembly and thereby cooperating with said head assembly for effectively varying the height of said rotary brush relative the floor, and (ii) a slide located within said head assembly, said slide being movably adjustable to anyone of said plurality of height positions ranging serially in ascending order between the bare floor position and the deep carpet position, and cooperating with said axle retainer assembly to raise or lower the head assembly and thus the rotating brush relative to the axle retainer assembly and floor to any one of said range of height positions; and

actuator means operatively coupled with said height adjustment mechanism for selectively and automatically actuating said trailing brush in conjunction with said height adjustment mechanism;

said actuator means including a pivotable lever mounted on the said head assembly and engaged with said height adjustment mechanism for moving said trailing brush between said extended position and said retracted position;

said actuator means further including a spring interposed between said head assembly and said trailing brush, such that said spring biases said trailing brush toward said retracted position; and

said slide of said height adjustment mechanism including means for engaging said lever when the slide is moved to the bar floor position and thereby causing said lever to pivot into engagement with the main portion of said trailing brush and move the trailing brush to a fully extended position against the bias of said spring;

whereby said trailing brush is automatically moved to said extended position in response to said height adjustment mechanism being moved to the bare floor position and moved to said retracted position in response to movement of said height adjustment mechanism away from said bare floor position.

2. A vacuum cleaner in accordance with claim **1** wherein said actuator means comprises:

said lever engaging means including a projection located on said slide and movable therewith;

said lever located within and pivotally affixed intermediate its free ends to said head assembly, one free end of said lever being of sufficient length to engage said trailing brush approximately intermediate the main portion thereof as said projection engages and rotates the other free end about the pivot axis of said lever to thereby move said trailing brush alternatively between said extended position and said retracted position.

3. A vacuum cleaner in accordance with claim **2** wherein said lever pivots about an axis generally perpendicular to the axis of rotation of said rotary brush.

4. A vacuum cleaner in accordance with claim **1** wherein said lever engages said trailing brush centrally

of the ends of said main portion to limit flexing in said trailing brush.

5. A vacuum cleaner in accordance with claim 1 wherein said slide includes a series of stair step detents varying in height and corresponding to a respective one of said plurality of height positions, said slide being supported on said axle retainer assembly whereby as the slide is reciprocated, the head assembly pivots about said axle retainer assembly to the height position selected.

6. A vacuum cleaner in accordance with claim 1 wherein said trailing brush has a generally U-shaped configuration whereby the brush extends from the distal ends of said main portion of the brush along the sides of said vacuum chamber to further entrap dirt or other particulates within the region of the vacuum cleaner.

7. A vacuum cleaner in accordance with claim 6 wherein said trailing brush includes a U-shaped holding strip having bristles extending thereupon, the distal ends of said holding strip being supported on said head assembly and defining a pivot axis about which said brush may pivot from the extended position to the spring urged, fully retracted position.

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